Health Consultation

Blood Lead Results for 2002 Calendar Year

HERCULANEUM LEAD SMELTER SITE

HERCULANEUM, JEFFERSON COUNTY, MISSOURI

EPA FACILITY ID: MOD006266373

AUGUST 14, 2003

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared by:

Missouri Department of Health and Senior Services
Section of Environmental Public Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

STATEMENT OF ISSUES AND BACKGROUND

Statement of Issues

In March 2003, the Missouri Department of Health and Senior Services (DHSS), in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR), presented to the Herculaneum Community Advisory Group preliminary results of all known blood lead data collected in 2002 from Herculaneum, Missouri residents. This health consultation will further evaluate that data and compare it to the 2001 blood lead data. Additionally, this health consultation will evaluate the blood lead data collected for children under 72 months of age who were serially tested in both years 2001 and 2002. Conclusions and recommendations in this document were made on the basis of data available as of March 14, 2003.

Background

The Herculaneum lead smelter is an active facility that has been in operation in the community since 1892. The Doe Run Company currently owns and operates the smelter. The facility is located at 881 Main Street in Herculaneum, Missouri, approximately 25 miles south of St. Louis, Missouri, on the Mississippi River. It abuts residential neighborhoods on the north, west, and south, with the Mississippi River on the east. A lead ore concentrate, consisting of approximately 80% lead sulfide, is processed at the smelter. The ore is transported by truck from eight lead mines operated by the company near Viburnum, Missouri, approximately 75 miles south-southwest of Herculaneum. The 52-acre Herculaneum facility consists of a smelter plant, a 24-acre waste slag storage pile, and an onsite sulfuric acid plant [1].

The city of Herculaneum has an estimated population of 2,805 people, according to the 2000 US Census. Several homes are within 200 feet of the smelter plant, and currently at least three homes are within 200 feet of the slag pile, of which one is being occupied. Figures 1 and 2 display the location of the smelter in relationship to the community [2]. Three schools are in the city: a high school, a middle school, and a junior high school. The elementary school is in nearby Pevely. No licensed day-care facilities are in the city of Herculaneum.

Environmental sampling has indicated that there is lead contamination throughout the community. For example, lead has been found in yard soils at concentrations up to 33,100 parts per million (ppm) [3]; in air ranging from non-detectable (ND) to 85 micrograms per cubic meter ($\mu g/m^3$) [4]; and in dust on streets up to 300,000 ppm [5].

Although multiple sources of lead could be contributing to the overall contamination (e.g., lead-based paint), an Exposure Investigation (EI) conducted by ATSDR in 2001 indicated that lead in paint and water at the two homes evaluated did not appear to be significant sources of lead exposure in the children with elevated blood lead concentrations from these homes [6]. Additionally, it has been documented that proximity to the smelter appears to be associated with higher blood lead levels (BLL) [2]. In 2001, 28 percent of the children in this community under 72 months of age who were tested had BLLs equal to or above 10 micrograms of lead per deciliter of blood (10 μg/dL) [7]. In the area closest to the smelter, east of U.S. Hwy 61/Commercial Blvd., 45% of the children under 72 months of age who were tested in 2001 had BLLs equal to or above 10 μg/dL [7]. BLLs above 10 μg/dL have been associated with the development of adverse health effects [8].

Efforts to address the overall contamination in the community have been ongoing since September 2001, when the Missouri Department of Natural Resources (MDNR) and the Environmental Protection Agency (EPA) confirmed that spillage of lead concentrate was occurring along transportation routes in the city [9]. This information prompted DHSS to alert MDNR that the risks to the public surrounding the site were clear and present and that they were an imminent and substantial endangerment to the health of residents of Herculaneum [9]. Subsequently, MDNR and EPA directed the Doe Run Company to expedite activities to clean up existing contamination and reduce/eliminate future contamination throughout Herculaneum. The Doe Run Company, with oversight from MDNR and EPA, has implemented several exposure reduction activities since that time, including the following:

- smelter air emissions and fugitive dust have been reduced by installation of a number of equipment up-grades and process modifications [9]. Only since the fall of 2002 has the facility come into compliance with the National Ambient Air Quality Standards for lead emissions of 1.5 micrograms per dry standard cubic meter (quarterly average);
- soil removal and replacement is being performed by the Doe Run Company (with oversight by EPA) in public and private yards, parks, and schools, as well as along roadsides, where lead levels are greater than 400 ppm (as determined by established methods). First priority was given to those yards where children under 72 months reside [9];
- in-house dust is being removed by the Doe Run Company in accordance with established methods, with oversight from EPA, in those residences with elevated lead dust levels [9];
- residences are being offered HEPA filter vacuums, regardless of whether their homes have been cleaned, to assist in controlling interior dust levels [9];
- the Doe Run Company has made modifications in the handling and transportation of the lead ore concentrate [9]; and,

- the Doe Run Company is offering a voluntary property acquisition of homes within a specified geographic area approximately 3/8 mile around the smelter. Priority was placed on those homes where children under 72 months of age reside [9].

Additionally, DHSS, in cooperation with ATSDR, has initiated health education for area residents and physicians to increase their awareness of public health issues associated with lead and the benefits of routine blood lead testing. In the past, DHSS and the Jefferson County Health Department (JCHD), in cooperation with ATSDR, have offered blood lead testing to the residents of Herculaneum and surrounding communities. One such testing effort occurred in Herculaneum in the past year. In September 2002, DHSS and JCHD offered a voluntary community-wide venous blood lead testing event.

According to Missouri state regulation 19 CSR 20-20.020, the results of all persons' blood lead tests, regardless of age or BLL, must be reported to DHSS by physicians, laboratories, and hospitals. The State Public Health Laboratory (SPHL), private physicians, and various laboratories have provided BLL data to the DHSS Office of Surveillance, which maintains databases on all reported blood lead tests.

The data set evaluated in this health consultation includes blood lead data collected by and/or reported to DHSS over the course of calendar year 2002, as required by the state regulation, as well as results from the screening event conducted in Herculaneum in September 2002. Additionally, this health consultation will include a comparison of the blood lead data collected in both 2001 and 2002 for children under 72 months of age. Laboratory analytical methods are not described, and they vary for all the data. However, the data are sufficient to permit a determination of whether BLLs in the community were elevated in 2002, and they are adequate to permit performance of a comparison of blood lead data of children serially tested in both 2001 and 2002.

Only data for Herculaneum residents are considered in this analysis (zip code 63048). For individuals who have multiple BLL results for the year, the highest BLL reported for the individual has been used in the summary of the 2002 data and in the comparison of the 2002 data with data from 2001. The evaluation of blood lead data for children under 72 months of age and serially tested in both 2001 and 2002 includes all blood lead data for those children tested in both years. For those children who have multiple BLL results for each year, the highest BLL reported in 2001 was compared to the last BLL reported in 2002. This comparison method was chosen in order to determine the overall decline in BLLs from the highest in 2001 to the most recent in 2002. Only test results from venous blood draws were used; any capillary test results have been removed from the data set.

2002 Blood Lead Data Summary

A total of 340 people were tested in 2002; 58 of these were children under the age of 72 months, 129 were children between the ages of 6 and 17 years, and 153 were adults age 18 or more. Of the children under 72 months of age, 8 had BLLs of 10 µg/dL or higher (14%). The children in this age group had BLLs ranging from 2–28 µg/dL, with an average BLL of approximately 6.4 µg/dL. Among children between the ages of 6 and 17 years, 2 had BLLs of 10 µg/dL or higher (1.5 %). The BLL range for this age group was from 2 to 14 µg/dL. Of the 153 adults tested, 6 had BLLs of 25 µg/dL or higher. The BLLs of men ranged from 2 to 33 µg/dL, and women's BLLs ranged from 1 µg/dL to 42 µg/dL.

Tables 1, 2, and 3 contain a summary of these results.

Table 1. Blood Lead Levels of Children less than 72 months of age for January through December, 2002, reported to DHSS for Zip Code 63048

Blood lead levels in µg/dL	Number of individuals
0–9	50
10–19	6
20–29	2
30 or higher	0

Table 2. Blood Lead Levels of Children between 6 and 17 years of age for January through December, 2002, reported to DHSS for Zip Code 63048

Blood lead levels in µg/dL	Number of individuals
0–9	127
10–19	2
20–29	0
30 or higher	0

Table 3. Blood Lead Levels for Adults 18 years and older for January through December, 2002, reported to DHSS for Zip Code 63048

Blood lead level (µg/dL)	Number of individuals
0–24	147
25–39	5
40–49	1
50 and higher	0

Data for other sensitive subgroups, such as fetuses theoretically exposed through women of childbearing age (15–44 years) and the elderly (i.e., 65 and older), were examined more closely. Table 4 summarizes this evaluation. This analysis found that 63 women of childbearing age were tested. In this group, only 1 had a BLL of 10 µg/dL or higher (42 µg/dL). Twenty-three of the women tested in this group were aged 15 to 17 years; the remaining 40 were 18 or older.

A total of 36 residents 65 years of age and older were tested. Six had BLLs of 10 µg/dL or higher, 2 females and 4 males. Twelve µg/dL was the highest female BLL, and 19 µg/dL was the highest male BLL.

Table 4. Blood Lead Levels for sensitive populations for January through December, 2002, reported to DHSS for Zip Code 63048

Blood lead level (µg/dL)	Women of child bearing age 15–44 years (n=63)	Elderly, 65 years and older (n=36)
0–9	62	30
10–19	0	6
20–29	0	0
30 or higher	1	0

Comparison of the 2001 blood lead data with 2002 data

In 2001, a total of 935 people were tested; 118 were children under the age of 72 months, 162 were children between the ages of 6 and 17 years, and 655 were adults age 18 or higher [7]. There was a 64% reduction in the number of individuals tested in 2002 compared to those tested in 2001.

Of the children tested in 2001 between the ages of 6 and 17 years, 13 of 162 had BLLs of 10 µg/dL or higher (8%), ranging from 10 to 19 µg/dL [7]. In comparison and as stated earlier, in 2002, 2 of the 129 children in this age group had BLLs of 10 µg/dL or higher (1.5%). A comparison of data from 2001 to 2002 shows an apparent 81% reduction in the prevalence of BLLs of 10 µg/dL or higher for children tested in this age group.

Additionally, in 2001 there were 655 adults tested. Two had BLLs of 25 µg/dL or higher [7]. The men ranged from non-detect (non-detect = BLLs too low to be detected by laboratory instrument) to 31 µg/dL, and women were from non-detect to 55 µg/dL [7]. In 2002, 6 of the 153 individuals had BLLs of 25 µg/dL or higher. For this age group, there were notably fewer people tested in 2002 than in 2001. Overall, there were no notable changes in the ranges of BLLs for the adult age group. However, there was an increase in the prevalence of adults with BLLs of 25 µg/dL or higher. Fewer than 1% of the adults tested in 2001 had BLLs higher than 25 µg/dL, compared to slightly less than 4% of adults tested in 2002. This change in rates could be due to increased awareness and screening of individuals most at risk for exposure to lead.

In 2001, 197 women of childbearing age were tested (15–44 years) [7]. With the exception of one woman who had a BLL of 55 μg/dL in 2001 and 42 μg/dL in 2002, all other women of childbearing age tested had BLLs less than 10 μg/dL. Of the 166 residents 65 years and older tested in 2001, 21 had BLLs of 10 μg/dL or higher—5 females and 16 males [7]. Twenty-one μg/dL was the highest female BLL, and 24 μg/dL was the highest male BLL [7]. Comparatively, in 2002, 6 of the 36 people tested had BLLs of 10 μg/dL or higher, 2 females and 4 males. In 2002, 12 μg/dL was the highest female BLL and 19 μg/dL was the highest male BLL.

When comparing the data, DHSS evaluated the children under 72 months who were tested in 2001 and 2002 more closely. Of the children under 72 months tested in 2001, 33 of the 118 had BLLs of 10 μg/dL or higher (28%), ranging from 10–31μg/dL [7]. Comparatively, in 2002, 8 of the 58 children tested had BLLs of 10 μg/dL or higher (14%), ranging from 10–28 μg/dL. The 2002 blood lead numbers indicate an apparent 50% reduction in the prevalence of elevated BLLs for children tested in 2001 in this age group.

When BLLs for children under 72 months of age residing east of Highway 61/ Commercial Blvd. (the portion of the community closer to the smelter) were examined exclusively, 30 of the 67 children tested had BLLs of 10 μg/dL or higher (45%) in 2001[7]. In 2002; 8 of the 46 children tested in this age group had BLLs of 10 μg/dL or higher (17%). The 2002 blood lead data for the children under 72 months of age residing in this area show an apparent 62% reduction in the prevalence of elevated BLLs compared to 2001 data.

Table 5 summarizes the comparison of 2001 and 2002 blood lead data for children under 72 months of age.

Table 5. Summary of Blood Lead Levels for Children under 72 months of age for Calendar Years 2001 and 2002, reported to DHSS for Zip Code 63048

	2001	2002
Total number of children under 72 months of age blood lead tested.	118	58
Range of BLLs for children tested who were under 72 months of age.	Non-detect*–31 µg/dL	2 µg/dL–28 µg/dL
Average BLL for children tested who were under 72 months of age.	8.0 µg/dL	6.4 µg/dL
Children under 72 months of age with BLLs of 10 µg/dL or higher.	33 (28%) of 118	8 (14%) of 58
Children under 72 months of age residing east of Highway 61/Commercial Blvd. (the portion of the community closer to the smelter) who were blood lead tested.	67	46
Children under 72 months of age residing east of Hwy. 61/Commerical Blvd. with BLLs of 10 µg/dL or higher.	30 (45%) of 67	8 (17%) of 46

* Non-detect = BLLs too low to be detected by laboratory instrument.

Additionally, DHSS reviewed the blood lead data collected from January 1, 2001 though December 31, 2002 with a focus on the subset of children under 72 months of age living in Herculaneum who were tested in both years 2001 and 2002 . A total of 141 different children were tested for BLL during that time period, 35 of which had serial blood lead screenings in both 2001 and 2002. Of the 35 children tested in both years, 31 were located east of Hwy 61/Commercial Blvd. (the portion of the community closer to the smelter). For those children who have multiple BLL results for each year, the highest BLL reported in 2001 was compared to the last BLL reported in 2002. This comparison method was chosen in order to determine the overall decline in BLLs from the highest in 2001 to the most recent in 2002. Twenty of the 35 children tested in both years had BLLs that remained less than 10 µg/dL. Twelve of these children who had BLLs less than 10 µg/dL in 2001 had a decrease in BLL in 2002. The remaining 8 of the 20 children who had BLLs less than 10 µg/dL in both years had BLLs that were either unchanged or because they were below the various laboratories' reporting limits, DHSS was unable to verify the change definitively. Nine of the 35 children with BLLs higher than or equal to 10 µg/dL in 2001 had a decrease to a BLL of less than 10 µg/dL in 2002. Five children

had BLLs higher than or equal to 10 µg/dL in 2001 and a decreased BLL that was still higher than or equal to 10 µg/dL in 2002. One child had an increase in BLL from 2001 to 2002. The blood lead level for this child increased from 11 µg/dL to 25 µg/dL. This child and his/her family have moved away from Herculaneum. The most recent venus blood lead level for the child, collected in 2003, has decreased to less than 10 µg/dL.

Table 6 contains a summary of these results. A further breakdown of this data is shown in Appendix A.

Table 6. Summary of Blood Lead Levels for Children under 72 months of age who were serially tested in both years 2001 and 2002, reported to DHSS for Zip Code 63048.

Individuals	Numbers
Total number of children tested in both 2001 and 2002 ➢ 31 of the 35 children located east of Hwy 61 & Commercial Blvd	35
Number of children with blood lead levels always less than 10 µg/dL in 2001 and 2002 ➢ 12 of the 20 children in this group had a decrease in blood lead level from 2001 to 2002	20
Number of children with blood lead levels higher than or equal to 10 µg/dL in 2001 with a decrease to a blood lead level of less than 10 µg/dL in 2002	9
Number of children with blood lead levels higher than or equal to 10 µg/dL in 2001 with a decreased blood lead level but still higher than or equal to 10 µg/dL in 2002	5
Children with an increase in blood lead level from 2001 to 2002 ➢ One child had a blood lead level higher than 10 µg/dL in 2001 with an increase in blood lead level in 2002	1

DISCUSSION

Childhood lead poisoning is a major, but preventable, environmental health problem. Children are a high-risk group. They are generally assumed to be at an increased risk of exposure to chemicals in soil because of their more frequent soil contact and their tendency to ingest soil, either intentionally or through normal hand-to-mouth behavior. Exposure to lead in utero, in infancy, and in early childhood may slow mental development and lower intelligence later in life. The Centers for Disease Control and

Prevention (CDC) recommends that BLLs remain below 10 µg/dL to decrease the likelihood of neurological and learning problems in children. Other unusually susceptible populations include the elderly, people with inheritable genetic diseases, alcoholics and smokers, and people with neurological dysfunction or kidney disease [8, 10].

Recent data from the *Second National Report on Human Exposure to Environmental Chemicals, 1999–2000* (NHANES) conducted by the CDC stated that the mean children's BLL in the United States is 2.23 µg/dL [11]. Average BLLs in the United States have fallen dramatically since the 1970s. In 1976–1980, the average BLL in children was 15 µg/dL, and in 1991–1994, the average was 2.7 µg/dL [8]. The national prevalence rate, 1999–2000 (NHANES), of BLLs higher than or equal to 10 µg/dL in children is 2.2% [11].

According to all the blood lead data provided to DHSS, there have been notable reductions in BLLs in the community from 2001 to 2002. However, blood lead elevations continue to be documented in this community. The data provided neither represent a random sample of the community nor represent the entire community; these BLLs are reflective of physician selection and/or self-selection. Although there has been an apparent 50 % reduction in the prevalence of elevated BLLs from 2001 to 2002 for children tested under 72 months of age living in this community, 8 of the 58 children tested in 2002 (14%) were found to have BLLs of 10 µg/dL or higher. This percentage is still notably higher than the national prevalence rate of 2.2% [11] and the State of Missouri rate of 5.0% for calendar year 2002 [12].

When BLLs for children residing east of Highway 61/Commercial Blvd. (the portion of the community closer to the smelter) are examined exclusively, 8 of the 46 children under 72 months of age tested in 2002 (17%) had BLLs of 10 µg/dL or higher. The 2002 blood lead data for the children residing in this area show an apparent 62% reduction in the prevalence of elevated BLLs compared to 2001 data for this age group. The average BLL in children under 72 months, regardless of proximity to the smelter, was approximately 8.0 µg/dL for 2001[7]. In 2002, there has been a reduction in the average BLL to approximately 6.4 µg/dL. Although there has been a decrease in the average BLL for tested children of this age group, the average BLL is still notably higher than the national mean BLL of 2.23 µg/dL [11].

Twenty-six children of 35 tested in both years had decreases in BLL in 2002. Of the 35 children tested in both years, one child had an increase in BLL from 2001 to 2002.

In 2002, 2 of the 129 children between the ages of 6 and 17 had BLLs of 10 µg/dL or higher (1.5%), compared to 13 of 162 children in 2001 (8%). A comparison of data from 2001 to 2002 reveals an apparent 81% reduction in the prevalence of BLLs of 10 µg/dL or higher for children tested in this age group.

Several factors could be responsible for the apparent reduction in the prevalence of elevated BLLs in children living in Herculaneum from 2001 to 2002. These factors include the actions taken by the MDNR and EPA to ensure that the Doe Run Company eliminates or reduces the sources of exposure; the community's increased awareness of potential pathways of exposure; modifications of home cleaning methods and changes in hygienic practices; and the actions taken by DHSS, ATSDR, and the JCHD to increase childhood lead testing in order to increase awareness of lead poisoning and its adverse health effects and to provide information about how to reduce exposures, especially for children. In addition, some of the children in the area most at risk to lead exposure from the smelter no longer reside in that area as a result of property buy-outs.

Although there have been notable reductions in the prevalence of elevated BLLs in children residing in this community, the prevalence of elevated BLL remains unacceptably high.

Any effects of lead at these levels on the health of children are likely to be subtle. Therefore, blood lead levels alone are not an indicator of adverse effects for an individual child. However, in considering populations (groups of individuals) exposed to lead, adverse health effects can be seen in groups with elevated blood lead levels [8]. Therefore, it is important that efforts to reduce exposure to lead in Herculaneum continue.

The 2002 data indicate that the average BLL for women between the ages of 15–44 is approximately 3.6 μg/dL. Comparatively, in 2001 the approximate average BLL for women in this age group was essentially the same—3.4 μg/dL [7]. However, in both years, the BLL has been higher than the national mean of 1.8 μg/dL for this age group [13]. No adverse health effects would be expected for women at this BLL level. Nevertheless, lead has been demonstrated to cross the placenta at levels less than 10 μg/dL and could potentially impact the health of the fetus [14]. The one female having a BLL of 55 μg/dL in 2001 and 42 μg/dL in 2002 has been advised that should she become pregnant she should alert her physician to her history of elevated blood lead levels. This individual was also given guidance on actions that could be taken to reduce exposure.

Individuals 65 years and older were found to have an approximate mean BLL of 5.7 μg/dL in 2002, slightly less than the approximate mean BLL of 5.9 μg/dL in 2001 [7]. However, again, the 2002 mean BLL is higher than the national mean BLL of 3.3 μg/dL. Six of the 36 people in this age group that were tested had BLLs of 10 μg/dL; however, no individual had a BLL of 25 μg/dL or greater. No adverse health effects would be expected from current BLLs [13]. Still, some past and present occupational and recreational exposures (e.g., crafts and hobbies) have been identified for this subgroup that may be contributing to the elevations.

Child Health Considerations

Children and adults are exposed to lead in many of the same ways. But children are not small adults. They differ in the behaviors that lead to their exposures as well as in their susceptibility to toxic effects from lead exposures. Children are more likely to play outdoors and bring food into contaminated areas. They are also shorter than adults, so they are more likely to breathe dust and soil that are close to the ground. Children are also smaller, resulting in higher doses of chemical exposure per pound of body weight [10].

Further, children have developing body systems that can sustain permanent damage if toxic exposures occur during critical growth stages. Compared to adults, children absorb more of the lead they take into their bodies, retain more of the lead they take in, and are more sensitive to its effects [10].

Children may be exposed to lead inside their homes, in and around their schools, and outside in their yards, playgrounds, and parks. This community is faced with widespread environmental contamination. Because children depend on adults for risk identification and management decisions, it is prudent that further lead exposure be prevented.

CONCLUSIONS

The blood lead data reviewed indicate that exposures have occurred, are occurring, and are likely to occur in the future and that these exposures may have an adverse impact on human health. Consequently, this site has been classified as a public health hazard. Specifically, DHSS concludes the following:

1. Fourteen percent (14%) of children living in this community who were tested in 2002 have blood lead levels known to cause adverse health effects (BLLs above 10 µg/dL). Seventeen percent (17%) of the children who were tested in 2002 who reside east of Hwy 61/Commercial Blvd. (the portion of the community closer to the smelter) have blood lead levels known to cause adverse health effects on a population level.

2. Of the females of childbearing age in this community tested for BLLs in 2001 and 2002, one female had BLLs in both years that could cause adverse health effects to her developing fetus if she became pregnant.

3. Although there have been sixty-four percent (64%) fewer people blood lead tested in 2002 compared to 2001, the data seem to indicate that less lead exposure occurred in 2002 than in 2001. This fact is evidenced by the apparent decrease in prevalence rates of elevated BLLs among children tested in 2002 when compared to those tested in 2001 and the notable number of children with decreased BLLs who were serially tested in both 2001 and 2002.

RECOMMENDATIONS

1. EPA and MDNR should continue to ensure that steps are taken by the lead smelter owners to eliminate/reduce the source(s) of lead exposure as soon as possible.

2. The one female of child bearing years who has an elevated blood lead level should make her physician aware of her history, especially if she should become pregnant, and take steps to reduce her current exposures to lead.

3. EPA and MDNR should continue to conduct environmental sampling to evaluate all lead exposure pathways for this community.

4. DHSS and JCHD should continue health education activities for the people in the community as well as for area health care providers. These activities should focus on awareness of lead poisoning, its adverse health effects, and how to reduce exposures and encourage blood lead testing, especially for children.

5. A health study should be conducted to evaluate the health impacts of lead on the community.

When additional information becomes available, DHSS will evaluate it thoroughly and, if appropriate, update existing assessment documents. ATSDR and DHSS will respond appropriately to any request for additional information or action.

PUBLIC HEALTH ACTION PLAN

The Public Health Action Plan (PHAP) for the Herculaneum Lead Smelter site contains a description of actions to be taken by the Missouri Department of Health and Senior Services (DHSS), the Agency for Toxic Substances and Disease Registry (ATSDR), and others. The purpose of the PHAP is to ensure that this health consultation not only identifies public health hazards, but also provides an action plan to mitigate and prevent adverse human health effects resulting from present and/or future exposure to hazardous substances at or near the site. Implicit in this plan is a commitment from DHSS and/or ATSDR to follow-up on this plan to ensure that it is implemented. The public health actions to be implemented by DHSS, ATSDR, and /or cooperators are as follows:

1. DHSS/ATSDR will coordinate with the appropriate environmental agencies to identify environmental sampling that needs to occur so that exposure pathways can be adequately identified and characterized.

2. DHSS/ATSDR will continue to evaluate any additional data that become available regarding human exposure or contaminants at the site, including identifying additional exposure pathways and evaluating health impacts of risk reduction and remediation plans.

3. DHSS/ATSDR have developed and are implementing a comprehensive health education plan in this community. Those efforts will continue, and they will focus on increased childhood lead testing, awareness of lead poisoning and its adverse health effects, and how to reduce exposures, especially for children.

4. JCHD/DHSS/ATSDR will continue to assure case management of children and other sensitive populations such as women of child bearing age with elevated BLLs.

5. DHSS/ATSDR are in the preliminary stages of initiating health study activities in this community.

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Attachments:

Figure 1—Site Map
Figure 2—Site Map
Appendix A—Supplemental Summary Table

Certification

This health consultation for the Herculaneum Lead Smelter Site was prepared by the Missouri Department of Health and Senior Services under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved methodology and procedures at the time the health consultation was initiated.

Technical Project Officer, SPS, SSAB, DAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Section Chief, SPS, DHAC, ATSDR

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Figure 1

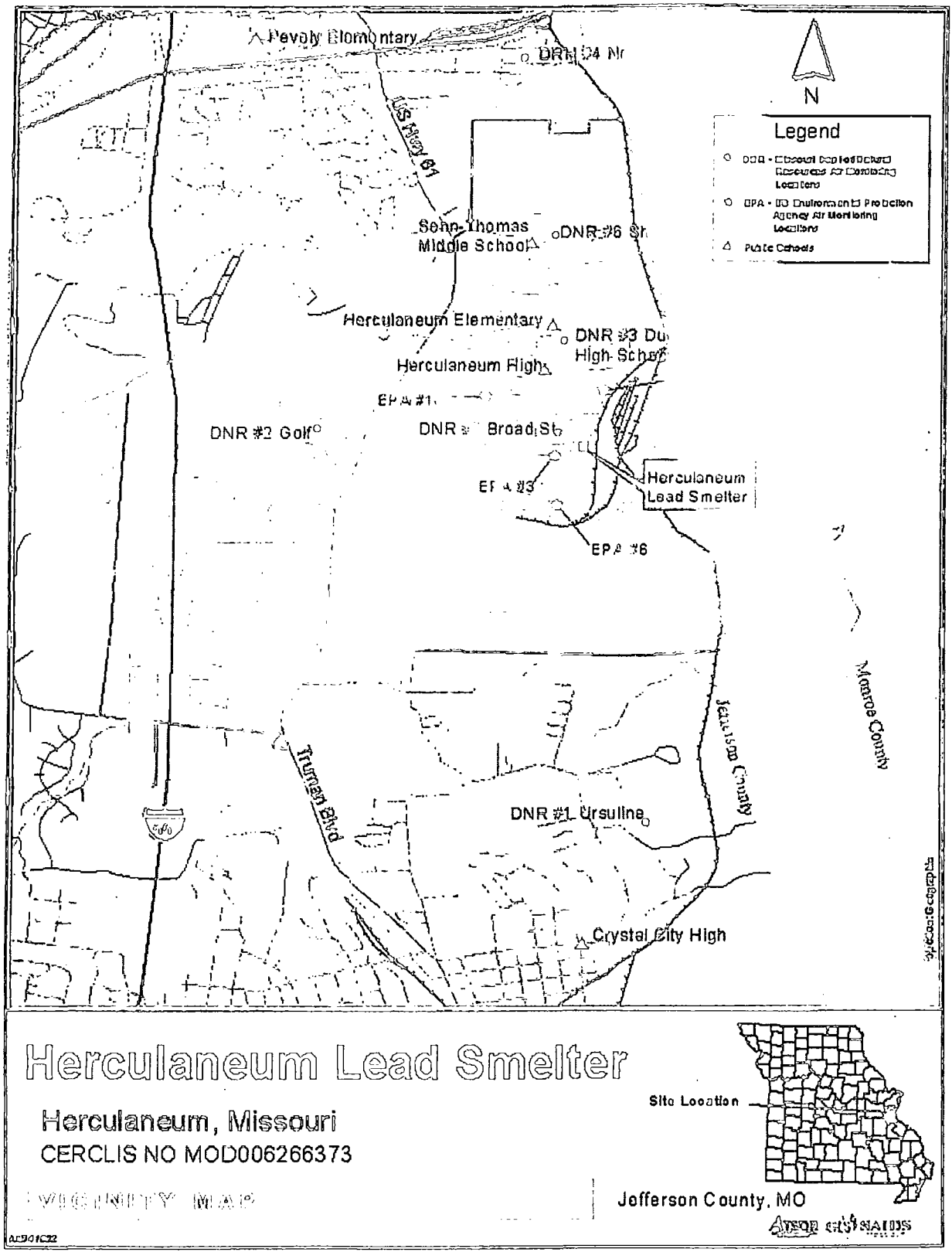
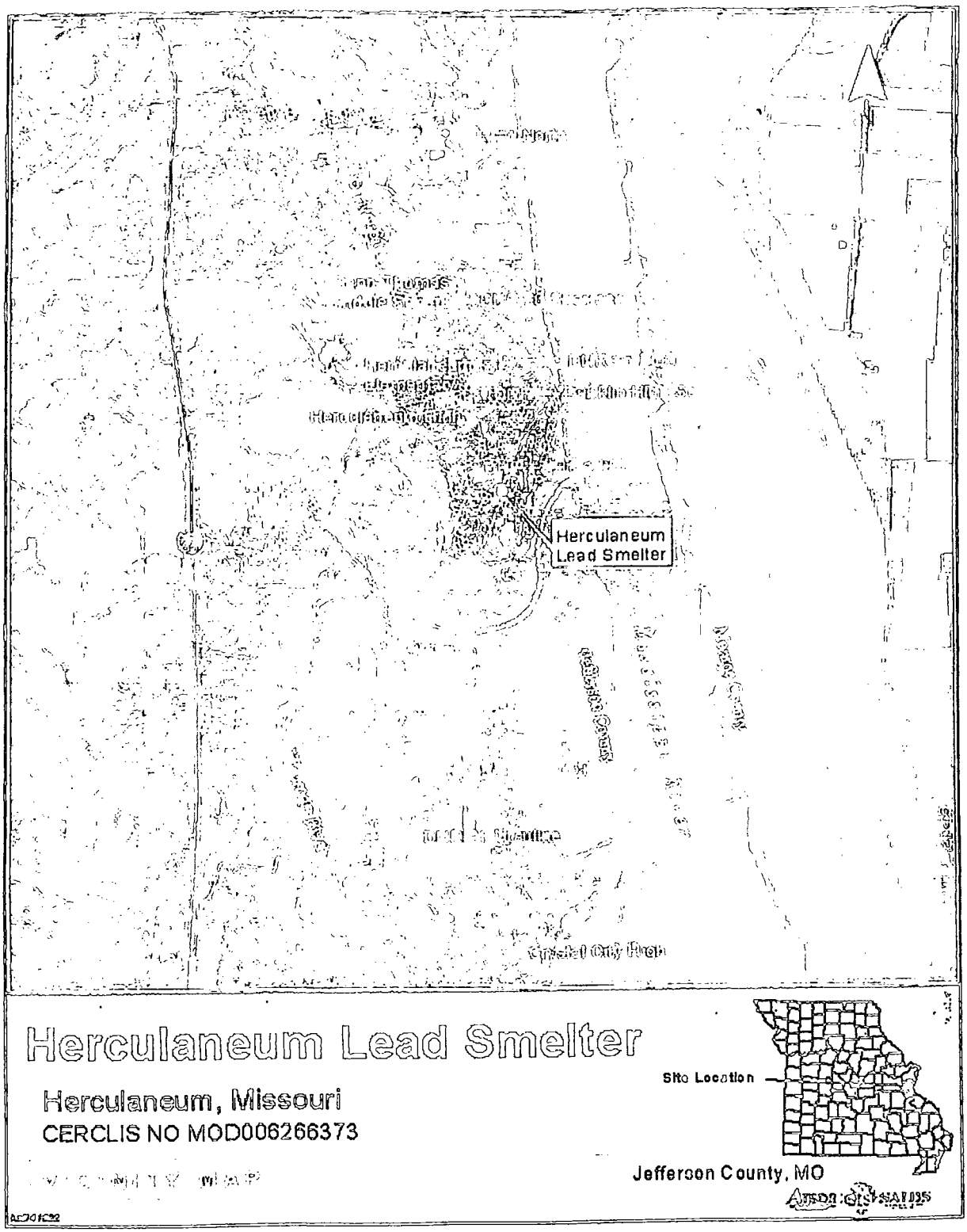

Pevely Elementary
DNR #4 Nr
US Hwy 61
Sohn-Thomas Middle School
DNR #6 Sr
Herculaneum Elementary
DNR #3 Du
High Schoo
Herculaneum High
EPA #1
DNR #2 Golf
DNR # Broad St
EPA #3
Herculaneum Lead Smelter
EPA #6
Truman Blvd
DNR #1 Ursuline
Jefferson County
Monroe County
Crystal City High
N
Legend
DNR - Missouri Department of Natural Resources Air Monitoring Locations
EPA - US Environmental Protection Agency Air Monitoring Locations
Public Schools
Herculaneum Lead Smelter
Herculaneum, Missouri
CERCLIS NO MOD006266373
VICINITY MAP
Site Location
Jefferson County, MO

Figure 2


Herculaneum
Lead Smelter
Herculaneum Lead Smelter
Herculaneum, Missouri
CERCLIS NO MOD006266373
Site Location
Jefferson County, MO

Appendix A

Missouri Department of Health & Senior Services

Summary of Blood Lead Data for Children Less Than 72 Months of Age Living In Herculaneum Who Were Tested in Both Years 2001 & 2002

Data provided:

- ARE NOT a random sample; therefore, it does not represent all children in the entire community
- DO represent a result of physician-selection and/or self-selection
- DO represent children tested by venous draw in BOTH Years 2001 and 2002
- ARE the best data available to the Missouri Department of Health & Senior Services

Table #1

Summary Table

Individuals	Numbers
Total number of children tested in both 2001 and 2002 ➢ 31 of the 35 children located east of Hwy 61 & Commercial Blvd	35
Number of children with blood lead levels always less than 10 µg/dL in 2001 and 2002 (Table # 2) ➢ 12 of the 20 children in this group had a decrease in blood lead level from 2001 to 2002	20
Number of children with blood lead levels higher than or equal to 10 µg/dL in 2001 with a decrease to a blood lead level of less than 10 µg/dL in 2002 (Table # 3)	9
Number of children with blood lead levels higher than or equal to 10 µg/dL in 2001 with a decreased blood lead level but still higher than or equal to 10 µg/dL in 2002 (Table # 4)	5
Children with an increase in blood lead level from 2001 to 2002 (Table # 5) ➢ One child had a blood lead level higher than 10 µg/dL in 2001 with an increase in blood lead level in 2002	1

The blood lead data summarized below have been reported by quarter in the following tables.

1st quarter = January–March **3rd quarter = July–September**
2nd quarter = April–June **4th quarter = October–December**

Table #2

Children with blood lead levels always less than 10 µg/dL in 2001 and 2002.

Total number of children in this group = 20

- 12 of the 20 children in this group had a decrease in blood lead level from 2001 to 2002

Child Identifier	Location = East of Wycliffe & Commercial Blvd, noted with an X	Blood lead data for 2001				Blood lead data for 2002				Note:
		1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter	Amount of decrease in blood lead level (using highest blood lead level reported in 2001 and last blood lead level reported in 2002)
3	X				8 µg/dL		7 µg/dL			1 µg/dL
10	X				5 µg/dL				4 µg/dL	1 µg/dL
17	X				8 µg/dL	7 µg/dL				1 µg/dL
35	X	<3 µg/dL		7 µg/dL	6 µg/dL	6 µg/dL				1 µg/dL
14	X				5 µg/dL	<5µg/dL	<5 µg/dL			≥1µg/dL
18	X			5 µg/dL		<5 µg/dL				≥1µg/dL
31					5 µg/dL	<5 µg/dL				≥1µg/dL
1	X				8 µg/dL	6 µg/dL				2 µg/dL
24	X				7 µg/dL	5 µg/dL				2 µg/dL
19	X			9 µg/dL		6 µg/dL				3 µg/dL
28	X	7 µg/dL	9 µg/dL	8 µg/dL	6 µg/dL	5 µg/dL			6µg/dL	3 µg/dL
15					9 µg/dL		5 µg/dL			4 µg/dL
Note: The following children's blood lead levels were either unchanged or because they were below the various laboratories reporting limits, DHSS is unable to definitively verify the change.										
		1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter	
2	X				<5 µg/dL		3 µg/dL			
7	X				<5 µg/dL			2 µg/dL		
12					<5 µg/dL			3 µg/dL		
20	X	<5µg/dL		<5 µg/dL		<5 µg/dL	<5 µg/dL	2 µg/dL		
22	X			<5 µg/dL		<3 µg/dL				
27	X			<3 µg/dL				4 µg/dL		
34				<5 µg/dL			<3 µg/dL			
8	X				6 µg/dL	6 µg/dL				

Table #3

Children with blood lead levels higher than or equal to 10 µg/dL in 2001 with a decrease to a blood lead level of less than 10µg/dL in 2002.

Total number of children in this group = 9

Child Identifier	Location = East of Hwy 61 & Commerce Blvd. noted with an X	Blood lead data for 2001				Blood lead data for 2002				Amount of decrease in blood lead level (using highest blood lead level reported in 2001 and last blood lead level reported in 2002)
		1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter	
5	X				10 µg/dL	8 µg/dL				2 µg/dL
25	X		10 µg/dL	9 µg/dL – Aug. 8 µg/dL – Aug.		7 µg/dL	7 µg/dL			3 µg/dL
4	X			11 µg/dL	10 µg/dL	9 µg/dL			7 µg/dL	4µg/dL
23	X				10 µg/dL	8 µg/dL			6 µg/dL	4 µg/dL
33	X		10 µg/dL	12 µg/dL			8 µg/dL			4 µg/dL
21	X				16 µg/dL – Oct. 13µg/dL – Dec.		9 µg/dL			7µg/dL
9	X			18 µg/dL – Aug. 15 µg/dL – Sept.		8 µg/dL				10 µg/dL
11	X			19µg/dL – Aug. 14 µg/dL – Sept.	11 µg/dL		9 µg/dL			10 µ g/dL
16	X				25 µg/dL – Oct. 14 µg/dL – Dec.	7 µg/dL				18 µg/dL

Table #4

Children with blood lead levels higher than or equal to 10 µg/dL in 2001 and decreased blood lead levels still higher than or equal to 10µg/dL in 2002.

Total number of Children in this group = 5

Child Identifier	Location = East of Hwy 61 & Commerce Blvd. noted with an X	Blood lead data for 2001				Blood lead data for 2002				Amount of decrease in blood lead level (using highest blood lead level reported in 2001 and last blood lead level reported in 2002)
		1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter	
26	X		14 µg/dL	11 µg/dL		8 µg/dL	11 µg/dL			3 µg/dL
30	X			14 µg/dL	13 µg/dL	10 µg/dL	10 µg/dL			4 µg/dL
29	X		15 µg/dL			8µg/dL		10µg/dL		5 µg/dL
32	X				19 µg/dL	16 µg/dL	14 µg/dL	13 µg/dL		6 µg/dL
6	X			28 µg/dL – Sept. 26 µg/dL – Sept.	15 µg/dL	16µg/dL				12 µg/dL

Table #5

Children with an increase in blood lead level from 2001 to 2002.

Total number of children in this group = 1

Child Identifier	Location = East on Hwy 61 & Commercial Blvd. noted with an X	Blood lead data for 2001				Blood lead data for 2002				Amount of increase in blood lead level (using the blood lead level reported in 2001 and last blood lead level reported in 2002)
		1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter	
13	X				11 µg/dL	12 µg/dL	28 µg/dL – Apr 25 µg/dL - May			14 µg/dL